

JPRS-UCH-88-011
6 JULY 1988



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JPRS Report

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JPRS-UCH-88-011

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Anabasine and Cytisine Derivatives—Reversible Inhibitors of Cholinesterases

18410300b Tashkent *KHIMIYA PRIRODNYKH SOYEDINENIY* in Russian No 1, Jan-Feb 88
(manuscript received 5 Jun 87, final revision 9 Sep 87)
pp 97-100

[Article by A.G. Dobrenkov, Z. Tilyabayev, D.N. Dalimov, and A.A. Abduvakhabov, Bioorganic Chemistry Institute, UzSSR Academy of Sciences, Tashkent]

[Abstract] A number of acyl analogues of acetyl-B-methylcholine (I) containing piperidine have already been shown to act as reversible inhibitors of cholinesterase. In a continuation of these studies, derivatives of (I) were obtained in which anabasine, cytisine, and their methyl iodides replaced the cyclic ammonium group. These new derivatives were shown to be effective reversible inhibitors of acetyl and butyryl cholinesterases (ACE and BuCE). However, hydrolysis of these compounds was not even observed with a 10-fold excess of ACE or BuCE. Anabasine acylates depressed ACE noncompetitively, whereas the inhibition of BuCE was competitive. Diiodomethyl derivatives of anabasine showed a higher ACE- and BuCE-inhibiting activity than did the parent compounds. The latter inhibited both enzymes at a nearly identical rate, with their antienzyme activity being little dependent on the number of carbon atoms in the acyl part of the ester grouping. The iodomethylates inhibited the enzyme activity of ACE and BuCE almost identically, but here the activity of the inhibitors was found to be a definite function of the structure of the alkyl radical. Increasing R to C₅H₁₁ increases the compounds' activities, whereas it is reduced when R equals C₄H₉. The acetyl derivative had a more pronounced activity in the case of ACE, whereas the propyl derivative had a more expressed activity in the case of BuCE. The butyl derivative was 10-fold more active against ACE and BuCE than was the ester of acetic acid. The B-methylcholine anabasine analogues that were synthesized have less pronounced inhibitory properties than do previously described choline analogues (specifically BuCE inhibitors). Cytisine analogues, although active against ACE and BuCE, were weaker than the anabasine

derivatives. Overall the cytisine derivatives were considered to be more effective against BuCE than against ACE. References 9: 8 Russian, 1 Western.

7813

Total Synthesis of Racemic Diptocarpidine and Diptocarpiline

18410300a Tashkent *KHIMIYA PRIRODNYKH SOYEDINENIY* in Russian No 1, Jan-Feb 88
(manuscript received 20 May 87) pp 76-82

[Article by O.V. Tolstikova, A.G. Tolstikov, V.S. Shmakov, Ye.G. Galkin, I.B. Abdrakhmatov, and S.F. Arpova, Institute of Chemistry, Bashkir Branch of the USSR Academy of Sciences, Ufa, and Institute of the Chemistry of Plant Substances, UzSSR Academy of Sciences, Tashkent]

[Abstract] Ureas have a special place among synthetic agricultural herbicides and pesticides because they have a broad spectrum of biological activity and participate in many physiological processes responsible for the growth and protective reactions of plants. By studying urea-type alkaloids, a simple method was developed for the synthesis of racemic diptocarpidine and diptocarpiline. Alkylation of potassium phthalimide with 1,6-dibromohexane yielded the corresponding phthalimide alkyl bromide, which, upon reaction with sodium methylmercaptide, yielded (6-phthalimidohydroxyl)methyl sulfide. The latter was reacted with hydrazine hydrate to yield 7-thiooctylamine, followed by reaction with phosgene to yield N,N'-(7-thiooctyl)urea. In another approach, 6-heptenic acid reacted with methylmercaptan gave 8-thianonanic acid, which was converted to acid chloride. Upon treatment with sodium azide followed by thermolysis, the latter produced the corresponding isocyanate, which was then converted to the desired N,N'-(7-thiooctyl)urea. Finally, N,N'-(7-thiooctyl)urea was converted to diptocarpidine and diptocarpiline with hydrogen peroxide. References 6: 4 Russian, 2 Western.

7813

Restructuring Benefits Sumgait Chemical Plant
18410283 Baku BAKINSKIY RABOCHIY in Russian 2
Apr 88 p 1

[Article by F. Akhundov, chief of chlorine product operations, "Organicheskiy Sintez" Production Association, Sumgait, under the "On the Road to Radical Reform" rubric: "Cost Accounting Initiates a Search;" first paragraph, BAKINSKIY RABOCHIY introduction]

[Text] The chlorine product operation is a new economic operations unit in the Sumgait "Organicheskiy Sintez" [Organic Synthesis] Association. It was formed by merging six shops and two sections. It now employs 700 persons. It produces six types of chlorine-containing products. The organization of the new production operation is the result of transformations being carried out at the enterprise for the purpose of improving its management mechanism. Now all raw materials and energy resources necessary for production of chlorine-containing products are under the management of a single collective.

Ya. Dzhabbarov's brigade in the electrolysis bath assembly department decided to work with a reduced crew. The brigade used to have 20 persons. But after estimating its capabilities, the collective took on the challenge of handling the same volume of work with a reduced crew—just 17 persons. The question that remained was who was to be dropped. When the brigade submitted the new crew list for approval, the list lacked the names of three workers whose exclusion seemed illogical at first glance. All three were experienced producers who had been repairing electrolysis baths for over a decade. But the brigade insisted on its decision before the production operation's management.

"What is important is not how long you've been working on paper, but your attitude toward the work," the workers defended themselves against those who doubted the correctness of the decision that had been made in the brigades' shop council. And they presented examples of times when those whom they were dropping from the brigade shirked their work, did it hurriedly and carelessly, or tried to shoulder the easier burdens, leaving the heaviest operations to others.

The brigade's decision had to be approved.

Ya. Dzhabbarov's brigade started working in close collaboration with the electrolyzer operators in the same electrolysis bath repair and assembly section. The benefit from this was mutual. The electrolyzer operators, who put out the operation's product, were not indifferent to how long a given electrolyzer would work without interruption. Before the transition to cost accounting was made, the repairmen used to change the electrolyzers without the consent of the equipment operators. But now they coordinate with the operators before replacing the units. And the operators make their recommendations

on replacing apparatus working at the lowest productivity. Thus the most productive equipment remains in operation. This also means that we get more products.

Cost accounting has compelled us to critically assess the situation that has evolved in the potassium hydroxide production shop. We were fulfilling the production plan, but we were unable to satisfy the norm for raw material expenditure per unit of product. The principal losses occurred in the settling and cooling unit. The production operation's engineers—M. Mamedov, F. Kasumov, and G. Tariverdiyev—proposed a number of changes to the existing restructuring plan that would not only improve the production process but would also make it possible to carry out the entire volume of work significantly faster. We acquainted the fitter, electrolyzer operator, and instrument controller brigades with the proposal of the specialists. G. Aliyev, K. Mamedov, A. Akopyan, R. Gulyants, and many others took an active part in the restructuring effort. Our efficiency experts, D. Dashtamirov, S. Nabiyeu, A. Astakhov, B. Fokin, and G. Grigoryan, contributed a number of improvements. And here is the result: While previously we consumed 1,829 kg of raw material to produce a ton of potassium hydroxide, this quantity has now been decreased to 1,700 kg; potassium chloride residues in the product were decreased from 1.8 to 1.5 units. And the fewer of these residues in the end product, the higher its quality.

We return residues containing potassium chloride back to the production process. Now we obtain 2 out of every 35 tons of product by processing these residues. This means over 1,000 tons in a year. This made it possible to reduce the cost from 230 to 219 rubles per ton; moreover, part of the savings is now used to pay the laborers, engineers, and technicians, whose wages have increased by 20 to 30 rubles since the beginning of the year.

Cost accounting encourages initiative and independence. And it is all the more disappointing when this initiative is unable to be fully manifested. Here is an example. We have a section that produces one of the types of chlorine products. Its workers have done much to upgrade product quality. But the product must be transferred and shipped to the consumer in special containers. Failure to comply with this condition causes the product to lose one of its qualities—its clarity; it becomes cloudy, and the recipient accepts it as a product that is a grade below the highest. The difference between payment for the highest grade and first grade is 15 rubles per ton. The supply of the special tanks is low. And although we manufacture a product in the highest quality class, we lose our earnings through no fault of our own.

The first quarter has come to an end. The analysis of work under cost accounting conditions will be more complete after we summarize the results of this period. But reliance on independence and cost accounting is already producing positive results. In 2 months of this year labor productivity increased in our production operation as a whole by 2.4 percent, we are ahead of the

production schedule by 226,000 rubles' worth of products, and we have economized on 65,000 rubles' worth of raw materials and energy resources. Despite the things that have happened in our city, the chemists did not stop the production process for even an hour. Welded together by a common goal—making a worthy contribution to fulfilling the quotas of the five-year-plan—we assumed the obligation of completing the half-year quota and surpassing it by tens of thousands of rubles' worth of above-plan products ahead of schedule, i.e., by the opening of the 19th All-Union Party Conference.

11004

Automated Micro-Pilot Chemical Engineering Installation

18410266a Moscow *KHIMICHESKAYA*
PROMYSHLENNOST in Russian No 2, Feb 88 pp
114-116

[Article by T.N. Shakhtakhtinskiy, R.M. Kasimov, E.M. Mamedov, Yu.V. Trushkin, Ya.S. Abdullayev, A.B. Mamedov, and I.G. Aliyev]

[Abstract] A study is made of the results of development of technical facilities for chemical engineering experimental control systems, using the Elektronika DZ-28 microcomputer in the control circuit. A typical two-reactor micro-pilot installation, of the OL-105 type, widely used to study the kinetics of homogeneous and heterogeneous catalytic processes and for testing industrial catalysts at high pressures, was selected for automation. This installation consists of two similar reactors of 250 cm³ volume each and a two-section heating system which can regulate reactor temperatures up to 600°C with an accuracy of 0.2%. The interface system between the reactors and the microcomputer is diagrammed and discussed. All software for the system was written in BASIC and is intended for use by non-programmers. The automated micro-pilot installation was used to study heterogeneous catalytic processes of oxidizing ethylene to acetaldehyde and propylene to acetone, as well as processes for producing acetaldehyde, acrolein, and propylene oxide by oxidizing propylene with hydrogen peroxide. Figures 3.

06508

Ukrainian Plenum on Development of Technical Creativity

18410295b Kiev *KHIMICHESKAYA*
TEKHNOLOGIYA in Russian No 2, Mar-Apr 88 pp
76-77

[Unattributed article: "The Plenum of the Ukrainian Republic Board of the All-Union Chemical Society imeni D.I. Mendeleyev on Developing the Technical Creativity of Workers in Light of the Decisions of the 27th CPSU Congress and the 14th Ukrainian Trade Union Congress"]

[Text] In accordance with the decisions of the 27th CPSU Congress and the decrees of the April (1985) CPSU Central Committee Plenum, the subsequent party

plenums, the 14th Ukrainian Trade Union Congress and the 6th Congress of scientific-technical societies of the Ukraine, the organizations of the VKhO [All-Union Chemical Society] imeni D.I. Mendeleyev are working to restructure the activities of the Society in order to increase efficiency and intensify the influence of the community on formulating technical policy and directing scientific-technical creativity toward the achievement of specific, positive results in the national economy.

Some 5750 society associations of VKhO members took part in this work. Definite progress has been made. For example, at the Saks Chemical Plant, a 41-member provisional creative collective has been made up from among the VKhO members, engineering and technical personnel and innovative workers. Economic agreements were concluded between the administration and the creative collective, specifying that, through a technology change in 1988, there would be a 3000 ton increase in hydrogen peroxide production, which will make possible an additional 2.4 million rubles worth of Persol output.

The creative youth collective Kompozit of the Institute of Physical Chemistry of the UkSSR Academy of Sciences developed a process to manufacture synthetic soil for hothouses, based on the wastes of the Kiev Khimvolokno Production Association. In 1986 a proportional coefficient totaling 1.3 million rubles was obtained from introducing the development.

The leading organizations of Kharkov, Kiev, Belaya Tserkva, Dnepropetrovsk and Lvov are working to form provisional creative collectives with the introduction of cost accounting elements.

The board of the republic, in conjunction with the VDNKh [Exhibition of UkSSR National Economic Achievements], organized an exhibition of the "Contribution of Scientists to Solving the Most Important Problems of Chemicalizing the National Economy." From its materials, lists were compiled of 182 developments from scientific research organizations, recommended for introduction at republic enterprises, and of industrial problems requiring a solution. The aim of the exhibition was to seek out possibilities of solving the problems of scientific institutions and industrial enterprises, entailed in putting scientific-technical achievements into practice.

The critical nature of our time, however, requires that attention and efforts be concentrated on work shortcomings and unsolved scientific-technical problems, among the first of which is an insufficiently active influence on fulfillment of the assignments of the plans for new equipment.

Since the beginning of the 12th Five-Year Plan, 12 assignments of the plans for new equipment and comprehensive target programs have not been fulfilled, and the assignments of the program "Izobretatelstvo i ratsionalizatsiya-90" [Invention Development and Efficiency-90] are not being fulfilled.

The primary VKhO organizations pay little attention to problems of developing and introducing energy-saving technology. Energy-intensive technology is being inserted into the developments of some institutes. The KF VNIIVproyekt, in the plan for modernizing the Sokal Chemical Fiber Plant, outlines a 50 kW-hr increase in the specific consumption of electric energy, which will lead to increasing it by 1.7 million kW-hrs per year. The primary organizations have not had timely expert appraisals of the plan, and it has been accepted for introduction.

Not all the primary organizations persistently pose the question of adherence to ecological equilibrium, efficient use of raw material, materials, heat and energy resources. For example, the Kalush Khlorvinil Production Association yearly dumps out about 500,000 tons of sodium chloride, and the Khimprom Production Association (Krasnoperekopsk) dumps 18 million cubic meters of natural brine into the Black Sea.

The URP VKhO committees for Problems of Efficient Use of Material Resources and for Problems of Processing and Utilizing Phosphogypsum in the National Economy have not worked out specific proposals to solve a number of important problems of an economical attitude toward resources.

Some 55 percent of the enterprises of the UkSSR Ministry of the Chemical Industry, in 9 months of 1987, produced goods in violation of the standards, and the enterprises of the USSR Petroleum Refining and the Petrochemical Industry and USSR Ministry of Mineral Fertilizer Production—respectively, 47 and 36 percent.

With respect to the results of 9 months of 1987, enterprises of the USSR Ministry of the Chemical Industry (97.2 percent), USSR Ministry of Mineral Fertilizer Production (95.6 percent), USSR Ministry of the Petroleum Refining and Petrochemical Industry (98.8 percent) and UkSSR Ministry of Industrial Construction Materials (98.5 percent) failed to fulfill the plan for sale of goods with regard to deliveries.

There is lagging behind, sizeable and unfulfillable before the end of year, at the following: the Dneprodzerzhinsk Azot Production Association and the Gorlovka Stirol Production Association, in the output of nitrogen fertilizers and ammonia, the Yavorov Sera Production Association and the Zagaypolsk Mine, in the output of sulfur (Sera Production Association), the Khimprom (Krasnoperekopsk) and Slavyansk Khimprom Production Association in the output of caustic soda and the Belotserkovskshina Production Association in the output of tires.

The enterprises of the USSR Ministry of the Chemical Industry failed to fulfill the plan for consumer goods production by the sum of 24.1 million rubles.

The Combined Plenum of the Ukrainian Republic and Kiev City administrations of the VKhO imeni D.I. Mendeleyev resolves:

1. To activate the work of the Ukrainian republic, Kiev City and oblast administrations of the VKhO imeni D.I. Mendeleyev on developing the scientific-technical creativity of the workers and to direct it toward accelerating scientific-technical progress in the sectors of the national economy, increasing production efficiency, solving major intersectorial problems, developing equipment, technology and materials that are new in principle, working out a state plan for the 12th Five-Year Plan and carrying out the assignments of the plan for the current five-year plan.

2. To confirm the plan for additional measures of the URP VKhO imeni D.I. Mendeleyev to increase labor efficiency (attached).

3. To recommend to the Kiev City and oblast administrations of the VKhO and sections and commissions of the URP VKhO: 3.1. Systematic study of the scientific-technical problems of the national economy, individual enterprises and organizations and rendering efficient assistance in solving them.

- 3.2. With a view to accelerating the process of restructuring in the work of the VKhO organizations, forming, in the administrations, sections and commissions, action committees to work out suggestions to increase the efficiency of the activities of the scientific-technical community, improve the forms of work, including cost accounting and give methodical assistance to the primary VKhO organizations, sections and commissions.

- 3.3. Activating work on introducing cost accounting methods.

- 3.4. Making a practice of listening in at meetings of the presidium of members of the administrations, sections and commissions on the work that has been done in the chemical society.

4. The Ukrainian Republic, Kiev City and oblast administrations of the VKhO must regard as exceptionally important the task of drawing all the specialists and engineering-technical personnel into efficiency and invention-development work, actively contributing to the most rapid introduction of scientific-technical achievement in production, fulfilling the republic's program, "Izobretatelstvo i ratsionalizatsiya-90," to develop the scientific-technical creativity of the workers and young people. Particular attention must be paid to

drawing young scientists, specialists, VUZ students and those studying in general education schools and agricultural vocational-technical schools into public creative associations.

5. With a view to intensifying the restructuring process, the presidium of the URP VKhO should be charged with

developing criteria to evaluate the work of the oblast administrations.

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1988

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Seminar on Physicochemical Mechanics and Vibration Methods

18410320 Kiev VISNYK AKADEMII NAUK
UKRAYINSKOYI RSR in Ukrainian No 3, Mar 88, pp
98 100

[Article by UkSSR Academy of Sciences Academician F.D. Ovcharenko and Candidate of Chemical Sciences V.Yu. Tretinnik: "Physicochemical Mechanics and Vibration Methods Serve Technical Progress: Republic Seminar in Odessa"]

[Text] In October 1987, a Republic seminar took place in Odessa. It was organized by the Republic House of Economic and S&T Propaganda; the Ukrainian SSR "Znaniye" [knowledge] Society; the AN UkSSR [Ukrainian SSR Academy of Sciences] Scientific Council on Problems of Colloid Chemistry and Physicochemical Mechanics; Colloid Chemistry and Hydrochemistry Institute imeni A.V. Dumanskiy, AN UkSSR; Odessa Higher Engineering Naval School (OVIMU); and the Ukrainian Republic, Odessa Oblast, and Kiev city Boards of the All-Union Chemical Society imeni D.I. Mendeleyev.

The work was organized in the form of plenary and section sessions and discussions based on stand papers. 22 papers, 32 information reports, and 68 stand papers were presented and discussed at the sessions. Over 200 representatives of scientific and higher educational institutions from Moscow, Leningrad, Kiev, Minsk, Riga, Tallinn, Tashkent, Kishinev, Odessa, Kharkov, Lvov, Poltava, Chernovtsy, Krasnodar, Tula, Ivanovo, Tyumen, Kazan, Tomsk, Gorky, Sverdlovsk, and other cities took part in the seminar.

In his opening statement, Chairman of the Organizational Committee, AN UkSSR Academician F.D. Ovcharenko, indicated that the seminar was dedicated to urgent problems of modern colloid chemistry science: rheology, vibrorheology and vibration technology. Its purpose was to exchange scientific achievements and practical results in these areas. This would facilitate faster implementation of scientific developments in the national economy and solving new complex tasks raised before the chemical science and industry by the 27th CPSU Congress.

In his opening statement, Acting Commander of the Odessa Higher Engineering Naval School V.K. Golubev talked of the contribution the School faculty makes to solving problems formulated in the "Main Directions of USSR Economic and Social Development in 1986-1990 and for the Period up to the Year 2000".

An important role in the program of plenary sessions was played by papers on basic research along priority directions of colloid chemistry, physicochemical mechanics, and chemical engineering. Academician V.V. Kafarov and Doctor of Chemical Sciences I.M. Dorokhov discussed methodological principles of integrated systemic

analysis of crushing processes for granular materials, presented a mathematical interpretation of the mechanism of disperse particle fracture, and proposed a criterion of random fracture.

AN UkSSR Academician F.D. Ovcharenko covered in great detail current problems and stressed priority directions of colloid chemical science. The speaker paid special attention to colloid technologies as the most promising in solving global social problems: rational utilization of countries' natural reserves of raw materials and environmental protection.

Doctor of Technical Sciences P.P. Ovchinnikov reported on results of theoretical studies in the field of vibrorheology and vibration technology. In particular, he dwelled on theoretical principles of applying vibration machines in the treatment of disperse systems and materials and methods for producing technical dispersions based on mechanical oscillations (vibrations); he also elaborated on broad possibilities of using vibration technology in powder metallurgy and in silicate engineering and industry.

The paper by Candidate of Chemical Sciences V.Yu. Tretinnik showed the importance of the theory and methods of physicochemical mechanics in controlling the process of structure formation in technical dispersions. Using concrete experimental material, he demonstrated that a newly defined field of knowledge, physicochemical mechanics, forms a scientific basis for the optimum technology of manufacturing disperse systems and composite materials for various technical applications, such as thixotropic drilling dispersions, suspensions, emulsions and ointment bases for manufacturing medical preparations, construction ceramics for walls, etc.

Doctor of Technical Sciences I.F. Goncharenko presented methods for construction and identification of rheological models for studying processes of structure formation under vibration. This promising research is conducted in close cooperation with OVIMU scientists. Under the direction of P.P. Ovchinnikov, they study and develop scientific fundamentals of nonstationary rheology and vibrorheology of multiphase systems.

Problems of intensifying processes of structure formation in disperse systems under the influence of vibration, of water-soluble polymers, of ultrasound and other physicochemical factors, and of determining the optimum mode for dispersing a solid phase were discussed in the section "Physicochemical Mechanics and Formation of Structure of Disperse Systems" (papers by Doctors of Technical Sciences G.S. Khodakov, V.M. Usakovskiy, O.V. Smirnov, and V.D. Gorodnov, and Candidates of Technical Sciences V.V. Parkhomenko, V.V. Minchenko, V.I. Obrobchenko, F.F. Mozheyko, and O.F. Skurko et al.). Interesting data on changes in kaolinite structure in the case of mechanical activation and on mechano-chemoabsorption modification of fillers for

composite materials were presented in papers by Doctor of Technical Sciences Yu.I. Tarasevich and Candidate of Technical Sciences Ye.V. Terlikovskiy.

Interesting papers and informative reports were presented in the section "Rheology and Vibrorheology." Thus, Doctor of Technical Sciences I.I. Blekhan talked about new results and unsolved problems in the field of vibration mechanics and vibrorheology, and Doctor of Technical Sciences M.V. Churayev proposed interesting calculations of rheological properties of dispersions, based on the theory of surface forces. Papers by Doctor of Technical Sciences E.P. Shulman, Candidate of Technical Sciences A.D. Matsepuro, and Doctors of Chemical Sciences Yu.F. Deynega and K.K. Popko examined the status of research in the area of the electrorheological effect in technology. These papers were the subject of lively discussions.

A paper by Candidate of Chemical Sciences A.V. Gamera, which dealt with rheological properties of highly concentrated disperse systems, and particularly with rheological behavior of highly concentrated water-coal suspensions, also stirred up a discussion. This paper and an informative report by T.D. Degtyarenko on the effect of lignosulfonates on rheological properties of water-coal suspensions merit special attention because the research results they presented are used in solving an extremely important problem, a new progressive method for transporting solid fuel—hydrotransport of coal.

The section was also presented with a paper by Candidate of Technical Sciences A.O. Terentyev on the efficiency of using surfactants and vibration to control properties of peat systems. The scientist demonstrated broad possibilities of controlling processes of structure formation of such systems, using two methods, adsorption modification of a disperse phase (peat) by introducing surfactants and vibration dispersion.

Application aspects of the use of vibration for control of rheological properties of technical dispersions were discussed in the section "Vibration Treatment Technology." Of the highest interest were results of theoretical and experimental studies conducted under the direction of P.P. Ovchinnikov at the Higher Mathematics Department and in the Laboratory of Vibration Treatment of Media and Disperse Materials of the OVIMU. Among them are systematic studies on selecting mathematical models for fine crushing and on applying methods for mathematical processing of experimental data for describing kinetic curves (papers by Candidate of Physical Mathematical Sciences A.F. Burdenko, Candidate of Technical Sciences N.D. Orlova, S.P. Polushkin, and I.I. Ryabets).

Interesting results of experimental studies on vibration crushing of materials with various chemical structures (metal oxides, hexagonal structured boron nitrides, etc.)

were presented in stand papers by O.P. Golubeva, L.M. Rusanova, G.P. Motsarenko, V.A. Kotlyarov, G.A. Petropavlovskaya, N.V. Svetelshchuk, and L.M. Rodionova.

Of interest were original designs of new vibration machines and vibration equipment developed at the OVIMU under the direction of P.P. Ovchinnikov and at the Moscow Evening Metallurgical Institute under the direction of I.F. Goncharenko.

During the breaks, the seminar participants visited the OVIMU Laboratory of Vibration Treatment of Media and Materials. This made it possible for them to familiarize themselves with vibration machines (VMN-20 and VUPP-200) under operation and get an idea of broad possibilities of application of vibration equipment and technology. This specific-purpose visit facilitated a more lively discussion of papers by Doctor of Technical Sciences I.F. Goncharenko and Candidates of Technical Sciences N.M. Novitskaya and V.M. Ponomaryov, which covered new principles of and devices for vibration crushing and mechano-chemical factors in processes of fine crushing of materials.

At the final plenary session, section leaders summarized the results of their sections' work and assessed stand papers. The seminar participants adopted a resolution that stressed the need to concentrate the effort of scientists and professionals on developing research along priority directions of colloid chemical science, physico-chemical mechanics of disperse structures, rheology and vibrorheology of disperse systems and composite materials, the theory of vibration crushing technology, granulation, and mixing of solid and granular materials.

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12770

Microhits and Luminescent Flashes During Hydrodynamic Cavitation

18410249b Moscow ZHURNAL FIZICHESKOY KHMII in Russian Vol 62, No 1, Jan 88 pp 194-196

[Article by A.V. Yefimov, G.A. Vorobyev, Yu.N. Trubitsyn, V.E. Volin, and S.F. Kakovskiy, Moscow Construction Engineering Institute imeni V.V. Kuybyshev]

[Abstract] The collapse of cavities during hydrodynamic fine-bubble cavitation is accompanied by pressure and temperature pulses, acoustic radiation, luminescence, and initiation of chemical reactions. These processes occur in microvolumes inside and outside the cavitation bubbles and are short-lived; because of the high amplitudes of their pulses, they play a principal role in the cavitation bubble's physical interactions with the environment. The luminescence occurring during hydrodynamic cavitation is the least studied of the aforementioned phenomena. In the present work the relationship

between luminescence, stream velocity, stage of cavitation development, and the cavitation bubbles' energy characteristics was studied. The experiments were carried out in a pressure cavitation hydropipe with a closed-circulation water stream and independent regulation of the velocity and pressure. It was shown that light flashes lasting 0.5 to 10^{-6} lux/s are observed during cavitation of the bubbles. A linear correlation was found between the integral energy values of the flashes and the microhits (coefficient, $r = 0.88$). It was shown that the

energies of the cavitation of the impact effects (E_i) and the light flashes (E_Φ) parallel the intensity of erosion, i.e., (E_i) and (E_Φ) could serve as indices of the erosion capacity of cavitation. This makes it possible to monitor the occurrence of hydrodynamic cavitation and make an online estimate of its erosion activity by using devices based on photomultiplier tubes. Figures 4; references 6: 5 Russian (1 by a Western author), 1 Western.

7813

**Suppression of Explosive Postradiation Low
Temperature Chlorination of Cyclohexane by
Loading of Solid Mixture Specimens**

18410262b Moscow *KHIMIYA VYSOKIKH ENERGIY*
in Russian Vol 22, No 1, Jan-Feb 88 (manuscript
received 20 May 86) pp 45-48

[Article by M.Yu. Messinev, deceased, and A.V. Polyakova, Institute of Chemical Physics, USSR Academy of Sciences]

[Abstract] A report is presented on the extremely strong influence of external mechanical loading on the rapid

postradiation process of chlorination of cyclohexane. Mechanical loading was found to suppress the rapid postradiation process quite effectively with very small loads. The phenomenon is explained by assuming that the primary process responsible for initiating the explosive process in the solid-phase system is crack formation. The cracks stimulate the development of a chain reaction with the participation of the gas phase. Mechanical loadings of a few hundreds of kPa are sufficient to suppress crack formation and thus inhibit the explosive process. Figures 2, references 8: Russian.

06508

Scientific-Technical Progress and Agricultural Chemicalization

18410295a Kiev KHIMICHESKAYA

TEKHNOLOGIYA in Russian No 2, Mar-Apr 88 pp 3-7

[Article by N.M. Gorodniy]

[Excerpt] The CPSU Central Committee and the USSR Council of Ministers adopted a decree on a Comprehensive Program for Chemicalization of the USSR National Economy in the Period to the Year 2000. It is noted in the program that the measures adopted by the party and the government for accelerated development of the sectors of the chemical complex have played and are continuing to play an important role in the considerable increase in output of various types of chemicals and in expanding its products list, scale and area of application. The rise in the level of chemicalization of the sectors of the national economy has ensured a substantial saving of power, material, labor and financial resources and an increase in social production efficiency and has contributed to an increase in the production of agricultural and other goods. Therefore, chemicalization has a special place in the intensification of agricultural production. With a view to this, it is stipulated that in 1990 agriculture will be supplied with 30-32 million tons of nutrients in mineral fertilizers, 440-480,000 tons of pesticides and at least 100 million tons of calcareous materials.

Efficient utilization of chemicals reduces agricultural production cost and reinforces economic management. The science and advanced practical work of the USSR and other countries in the world has proven that every third agricultural product is obtained through correct use of fertilizers. According to the data of science and production, on the average for the years of the 11th Five-Year Plan, a one-ruble expenditure for the application of mineral fertilizers was paid back by 2.55 rubles

To reduce the loss, the proper quality of fertilizers must be ensured at the plants, and the assortment and physical-chemical properties of the fertilizers be improved. The least disruption in the technological process by an operator leads to an output of goods that do not correspond to GOST. As an example, even the slightest underestimated concentration of nitric acid, disruption in vacuum in the evaporation system or uneven feed of sulfuric acid affect the quality of the ammonium nitrate—its moisture content will exceed the norm and the granule composition will become uneven. This sort of niter, carbamide and nitrophoska cakes up during transport and storage and this results in uneven application and sharp reduction in their agricultural efficacy.

O.F. Balatskiy et al. (1986), for quantitative evaluation of economic damage, use three basic methods: the direct accounting method, based on a comparison of the indicators of the polluted and conditionally pure (control) regions; analytic, consisting of obtaining the mathematical relationships (for example, through multifactorial analysis) between the indicators of the state of the economic system and the pollution level of the environment; generalized, based on the fact that the ratio of the pollution damage, obtained on the basis of the first two methods, to the net objects is correlated and transferred to similar and studied objects. In this way a methodology is created which forms a basis for empirical evaluations of individual damage. The direct accounting method is the key to creating the information base.

The economic effect from returning one hectare of land to agricultural use is from 2 to 15,000 rubles per year. Eliminating one ton of atmospheric emissions averts economic damage amounting to 150-200 rubles a year. The specific damage to agriculture (according to O.F. Balatskiy [2]) with an average yearly pollution concentration of 0.02-0.2 mg/m³ was (in thousand rubles):

Ingredient		0.02	0.05	0.1	0.15	0.2
Ash			6	11	18	15
Sulfur Dioxide	3		8	16	24	32
Nitric Oxide	--		14	28	42	55

worth, and for pesticides—4.81 rubles worth of output. A single ton of mineral fertilizers yields an addition in output that makes it possible to satisfy the yearly consumption, for example, of bread for 40 persons, or milk—for 10, or sugar—45, or vegetables—70, or vegetable oil—for 80 persons. In the course of its transport, storage and placement in the fields, however, according to the most conservative calculations, we yearly waste 10-12 percent of the products, which constitutes over 2 million tons of fertilizers, or—as a comparison—almost as much as is obtained from the farms of Uzbekistan and the Baltic republics, taken together. Even if only 1 percent of the mineral fertilizers is protected against loss, about 1 million additional tons of grain per year can be obtained from this alone.

In consideration of the importance of this problem, the Ukrainian Academy of Agriculture, in conjunction with the Ukrainian Republic Board of the All-Union Society of Chemistry imeni D.I. Mendeleev, in May 1987, for the first time conducted a Republic Scientific-Production Conference on the subject: "Using Industrial Wastes in Fertilizer Production and Their Agrochemical Effectiveness." The conference, conceived as a republic one, went beyond the framework of the USSR; eminent specialists from Moscow, Minsk, Tallinn, Gomel, Irkutsk and other cities of the fraternal republics participated.

Scientific and production personnel were very interested in the scientific production conference. This is evi-

denced by the large geographical range of its participants, including representatives from almost all the union republics, leading scientific-research institutes and plant and agrochemical service specialists. Scientists Yu.F. Zhdnov, O.A. Streltsov, N.F. Vovkotrub and others suggested ways to utilize wastes, gave their agrochemical evaluation and worked out specific recommendations on utilizing wastes to increase the raw material base of fertilizer production, evaluated new types and forms of them and outlined the paths to environmental conservation. The conference feels that USSR Gosplan, the Ministry of Fertilizer Production and Soyuzselkhozkhimiya, specialists and the community should pay particular attention to this problem.

The conference resolution recommended that a comprehensive research program on utilizing industrial wastes in agriculture be worked out. It was acknowledged expedient to form a republic coordination council on this problem. By unanimous opinion of the conference participants, the Ukrainian Academy of Agriculture should be the base organization for the creation and activity of the coordination council. A comprehensive approach to solving the problems posed will contribute to improving fertilizer production and, consequently, fulfilling the Food Program.

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12151

Emission Spectrum During Heat Inflammation of Ozone in Ultraviolet and Visible Ranges

18410247b Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA: SERIYA 2, KHIMIYA in Russian Vol 28, No 6, Nov-Dec 87 (manuscript received 24 Sep 86) pp 600-601

[Article by O.V. Kuricheva, B.S. Lunin, V.V. Timofeyev, and Yu.N. Zhitnev, Department of Physical Chemistry, MGU]

[Abstract] The use of transitions between the electron states of diatomic molecules during atom recombination is one of the newer ways of obtaining effective lasing in the visible and UV ranges. One of the possible reactions is $O + O$ yields $O_2 + hv$. The goal of this work was to investigate the luminescence spectrum of the reaction of the radiation recombination of atomic oxygen in the 220-630 nm range. A broad radiation continuum was noted in the near-UV range with a maximum at about 325 nm, which was probably due to the $O_2(B^1\Sigma_u)$ to $O_2(X^1\Sigma_g)$ electron transitions, and bands in the 610-640 nm range that were evidently due to the transition of $O(^1D)$ into the basic state. These data could be useful in selecting conditions for creating active media for photo-recombinant lasers. The luminescence observed can also be used in determining the kinetic parameters of fast reactions. The experimental setup and the luminescence spectrum are reproduced graphically, Figures 2; references 5: 3 Russian (1 by Western authors), 2 Western.

7813

Chain Breakdown of Ozone in Presence of Hydrogen Bromide Additives During Photolysis with Red Light

18410247a Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA: SERIYA 2, KHIMIYA in Russian Vol 28, No 6, Nov-Dec 87 (manuscript received 5 Jul 86) pp 551-555

[Article by S.N. Tkachenko, M.P. Popovich, and Yu.V. Filippov, Department of Physical Chemistry, MGU]

[Abstract] Studies of the photolysis of ozone with HBr are of practical interest since the latter is used as an inhibitor in ozone-hydrogen bromide lasers. This reaction was studied with the pressure of the O_3 ranging from 1.5 to 15 mm Hg and that of the HBr additive ranging from 0.02 to 0.75 mm Hg. The laser's radiating power ranged from 20 to 60 mW. Shortly after the reagents were mixed, a "darkish" decomposition of the O_3

became apparent, but this phase was not investigated. The initial quantum yields were determined as a function of the initial HBr pressure. This initial quantum yield increased with increasing additions of HBr to the O_3 , reaching a limit value of 15.5 plus or minus 2.2 molecules per quantum. The high yield values showed that ozone photolysis in the presence of HBr additives occurs by a chain mechanism. At the same time this quantum yield decreased as the radiation dose increased. During the O_3 -HBr photolysis about 70 different elementary reactions could take place. A reaction mechanism for $O_3 + HBr$ that is analogous to that of $O_3 + H_2$ was proposed. The recombinations of bromine monoxide and atomic bromine with perhydroxyl radicals may be the most significant of the probable reactions involved in the breaking of the chains. Figures 2; references 17: 12 Russian, 5 Western.

7813

Mechanism of Explosive Reactions of Ozone and Its Mixtures with Hydrogen in Gas Phase

18410249a Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 62 No 1, Jan 88 (manuscript received 29 Aug 86) pp 40-44

[Article by S.N. Tkachenko, M.P. Popovich, and Yu.V. Filippov, Department of Chemistry, Moscow State University imeni M.V. Lomonosov]

[Abstract] Studies of thermal stability and the type and limits of the explosive nature of ozone and ozone-hydrogen mixtures are of interest in chemical laser technology where this system is used to produce far-IR radiation. Previous work showed that gaseous ozone is an unstable, explosive reagent, its inflammation being a heat explosion process. Only one paper has been published on explosions of O_3 - H_2 mixtures. Therefore, this process was studied in the 100 to 225°C temperature range by using pure O_3 and a 1:3 mixture of O_3 and H_2 . The activation energy and inflammation range were determined. Inflammation of ozone was shown to follow a heat explosion mechanism in which the following two reactions were crucial: $O_3 + M$ yields $O + O_2 + M$ and $O + H_2$ yields $OH + H$. In general, the results agreed with those published in the only other related study reported in the past. O_3 - H_2 mixtures exploded at higher pressures than did pure oxygen, the reason being that the activation energy of the former process was lower than the activation energy for pure ozone. Figures 3; references 21: 14 Russian (2 by Western authors), 7 Western.

7813

**Medium Silicon Cycles. Part 2.
N-Hydroxyethyl-Substituted
Perhydro-1,3,6,2-Dioxasiloxanes. Synthesis,
Transmutations, and Mass Spectra**

18410300c Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 58, No 3, Mar 88 (manuscript
received 14 Dec 86) pp 548-552

[Article by V.M. Dyakov, A.F. Makarov, A.N. Kiryanova, A.Ye. Chernyshev, and V.N. Bochkarev, State Scientific Research Institute of Elemental Organic Compounds, Moscow]

[Abstract] N-hydroxyl-substituted perhydro-1,3,6,2-dioxasiloxanes (I), first obtained by Fortillan, have been proposed as therapeutic agents for the treatment of atherosclerosis and other cardiovascular diseases. A series of approaches to the synthesis of these compounds

is cited from the literature. The goal of this study was to synthesize N-hydroxyethyl derivatives of (I). Reaction of chloromethyltrimethoxysilanes with triethanolamine led to the formation of 1-methoxy-9-homosilatrane. In the case of parent chloromethyl methyl diethoxysilane, 1-methyl silatrane was obtained even in the absence of an alkaline catalyst or in the presence of Lewis or p-toluyll sulfonic acids. Evidently an unstable 2-chloromethyl silazocane was formed and broke down to silatrane after internal rearrangement. Mass spectrometric breakdown of N-hydroxymethyl-(I) is accompanied by intensive emission of a nitrogen atom, thus showing the absence of a distinct transannular reaction between the silicon and nitrogen atoms. References 17: 13 Russian (3 by Western authors), 4 Western (1 by Russian authors).

7813

Priority Trends of Development of Coke Chemistry. Level of Development of New Equipment and Technology in the USSR

18410266b Moscow KOKS I KHIMIYA in Russian No 1, Jan 88, pp 2-7

[Article by N.V. Braun, USSR Ministry of Ferrous Metals]

[Abstract] The program of goals for the coke chemical industry for 1986-1990 calls for introduction of a number of new technological processes for preparation and coking of coal, including some using imported equipment. This article briefly describes the level and status of technical progress trends in Soviet coke chemistry in the following areas: 1) Partial briquetting of charges, utilizing 13 briquetting installations purchased in Japan plus 17 installations manufactured in the USSR using domestic bitumen binder. 2) Coal charge ramming using West German equipment. 3) Selective grinding of coal using Soviet developments based on pneumatic separation of coal in a fluidized bed. The technology and most of the equipment are protected by authors' certificates. 4) Charge heat treatment, utilizing installation with a capacity of 1.07 million tons of coke per year now being installed at the Western Siberian Metallurgical Combine. 5) Production of formed coke without addition of binder using a process protected by authors' certificates at the Dagleyskiy Coke-Chemical Plant, to be put on stream in 1989. 6) Trapping of chemical coking products to provide for purification of waste gases while yielding valuable products. The Soviet Union lags in this area, and construction of sulphur purification shops developed in the Soviet Union is needed to improve the situation. 7) Processing of chemical coking products, another area in which the Soviet Union lags behind most foreign countries. Foreign nations emphasize the production of products from coal tar, an area which should be expanded in the Soviet Union as well. 8) Production of coal pits, an area in which the USA and Japan lead the world, although pressure treatment of resin, production of impregnating pitch and manufacture of special types of pitch for carbon-graphite materials are to be introduced soon. 9) Protection of the environment from pollution by contaminated waste water, an area in which the Soviet Union is at the same level as the rest of the world, actually leading in the utilization of purified waste waters within coke-chemical production facilities. The Soviet coke chemical industry lags behind the world in the rates and scale of industrial utilization of new technologies such as briquetting, ramming, thermal preparation, selective grinding, production of formed coke, use of sintering additives, and in the area of creation of new designs of coke batteries with furnace chambers of 60 m³ and larger. The Soviet Union is particularly behind in the use of computers and automatic process controllers for composition of coal charges, stabilization of charge and coke quality and heating of furnace chambers.

6308

The Artificial Gas of Fan-Yagnob

18410233c Dushanbe KOMMUNIST
TADZHIKISTANA in Russian 20 Jan 88 p 3

[Article by Yu. Valibekov, senior scientific associate, Institute of Chemistry imeni V.I. Nikitin, Tadzhik SSR Academy of Sciences: "The Artificial Gas of Fan-Yagnob;" first paragraph is KOMMUNIST TADZHIKISTANA introduction]

[Text] Plasma is the most widespread state of universal matter. It is ionized gas in which the concentrations of positive and negative charges are equal. The basic features of plasma are high temperatures, a concentration of a large quantity of energy in a small volume and the effect of ionized gas on many chemical and physical processes.

Before the development of apparatus and equipment that were adequate to obtain low-temperature plasma (from 1000 to 20,000 degrees), the scientists had to solve both purely engineering-technical and design problems. Several types of plasmotrons with a capacity of from 50 kilowatts to 10 megawatts have now been developed. The plasmotron contributed to the discovery of a new sector of modern science—plasmochimistry, which has formed as an independent science in the last 15-20 years.

The use of plasmochimical technology is opening up new ways of controlling chemical reactions, as well as carrying out diverse physical-chemical processes with maximum effectiveness and minimum environmental pollution. Almost all the plasmochimical processes take place in hermetically sealed units and yield no wastes.

Soviet scientists, engineers and designers have already developed over 50 different plasma and plasmochimical processes. Plasmochimical technology is picking up speed. The use of low-temperature plasma is becoming a characteristic phenomenon of modern industrial and applied chemistry. The key to new technological discoveries lies in the temperature characteristics of plasma.

Various types of raw material can be used for plasmochimical pyrolysis—from natural gas to crude oil, gas condensate, oil shales, peat, hard and brown coals and the wastes of the petrochemical and petroleum refining industry.

Tadzhikistan has considerable reserves of solid fuel mineral resources. This is natural hydrocarbon raw material. Its chemical processing into energy-intensive products or gaseous fuel is tremendously important for the national economy in connection with the reduction in world supplies of oil and natural gas.

One of the advanced directions for coal processing is its conversion into liquid chemical products through thermal dissolution in an autoclave, under pressure, at low temperature. Another is conversion into gaseous products under the high-temperature conditions of plasmochemical reactors.

The efficiency of using gaseous fuel stipulated the problem of producing fuel gases from coal as among the most important. Work on plasmochemical gasification of coal to obtain industrial and power gas has been particularly intensive in several countries in the last 10 years. A search is in progress for plasmochemical methods of gasifying highly oxidized and low-grade coals, used in power engineering. The research is of practical interest for our country, including the republic.

As is known, the major Fan-Yagnob hard coal deposit is located in the territory of Ayninskiy Rayon. It is expedient to perform its plasma gasification at the site, and to transport the gas obtained along pipelines in Dushanbe.

In the last few years the Institute of Chemistry imeni V.I. Nikitin of the Tadzhik SSR Academy of Sciences has performed basic laboratory research on the plasma gasification of Fan-Yagnob coals. The work is continuing in the current five-year plan. This method is characterized by good heat transfer, ease of temperature regulation and favorable kinetic conditions for chemical reactions. A high stage of converting coal into gaseous fuel is being reached. The experimental tests confirmed our theoretical calculations, and the results of the plasma gasification of the Fan-Yagnob coal are encouraging. The technical-economic indicators as applied to plasmochemical technology with a yearly productivity of 2.8 billion cubic meters of gas a year were also calculated.

Plasmochemical gasification of coal, in any event, has good economic indicators. The expenditures (42 rubles per 1000 cubic meters of gas) are 10 percent lower than with ordinary gasification.

In addition to developing a plasmochemical unit for the industrial capacity, the capital investments required are almost 50 percent less than for ordinary gasification. All of this gives grounds for assuming that in the near future plasmochemical technology will become an integral part of mass and special production.

I should like to direct the attention of the Tadzhik SSR Gosplan and the Presidium of the republic's Academy of Sciences to solving the problem of plasma gasification of Fan-Yagnob coal to provide the industrial projects and housing of Dushanbe with artificial gas instead of natural gas. The research being done by the Institute of Chemistry needs the support of these agencies.

Minister Interviewed on Petroleum, Petrochemical Industry Work

18410233a Moscow IZVESTIYA in Russian
17 Feb 88 p 2

[Interview with N.V. Lemayev, minister of the USSR Petroleum Refining and Petrochemical Industry, by V. Romanyuk]

[Text] "The criterion for the restructuring of any sector is not the fulfillment of low-efficiency plans according to the volume indicators, but the technical improvement of production, efficient use of resources and introduction of true, not formal cost accounting"—the minister began his conversation with these words.

[Question] Do you have in mind the net output indicator, which was first used under the conditions of self-financing?

[Answer] For us this was not just a fad—it began as an objective necessity. The point is that for 20 years the sector has followed the course of a constant increase in capacities for primary petroleum refining. They reached the maximum and stopped—they came up against a wall. Our commodity output constitutes three-fifths of the cost of the petroleum and casing-head gas, and the possibilities for further increase in motor fuels through an increase in raw material have been practically exhausted. Therefore, we have also resorted to using the net output indicator to evaluate the growth of productivity and the formation of the wage fund. In essence, this is a counter-expense indicator. Specifically, each percent of reduction in materials-intensiveness gives us a net output addition of over 280 million rubles.

Net output eliminates the pressure of the "gross" and makes the pursuit of commodity output completely unnecessary. It is as if we were taking a reverse path—from the expense to the counter-expense mechanism: we are not increasing, but reducing the input of raw material, energy and labor resources. I am convinced: if you place a person in a condition in which he obtains personal gain from sensible saving, he will fight for this saving with all his might. The net output indicator is good in that it does not simply figure the saving of input, but picks it up in dynamics: with more savings—net output also grows, and with less savings—it drops.

[Interviewer] We have not introduced our collocutor—let us do this. Nikolay Vasilevich Lemayev, minister of the USSR Petroleum Refining and Petrochemical Industry, recently turned 58. But as a minister he is young—he has held this post just a little over two years. He began his career as an operator at the Novoufimskiy Refinery. After ten years he rose to deputy chief engineer here, and graduated from a petroleum institute night school. Then he was appointed director of the newly constructed

petrochemical complex in Nizhnekamsk, where he worked for 22 years. This is now one of the major associations in the sector, including 16 plants and 5 administrations.

I asked Nikolay Vasilevich whether he carried over to the ministry the work style of the director of an association, even a major, advanced one? He, not at all disturbed, confirmed: he would like the ministry to operate according to its own qualitative indicators and according to the actual yield, like an association. Well, so then, let it be that way. We note, in any case, that the new minister came to the sectorial administration on a wave of radical reform, unburdened by the weight of old stereotypes of thought and action, not even having command of the "rules of the game."

[Answer] "We 'forced our way' into the new economic mechanism of our own free will," continued the minister. "No one called us up and trained us for this. When the first sectors went into self-financing, their funds were formed from the 'gross' and it did not matter what kind of output—as long as there was a little more of it. This way did not suit us: there would be no increase in raw material in either this five-year plan or the subsequent one. If the machine building complex grows at high rates, we are obliged to provide the machine tools and machines that they produce with fuel, oil, tires, etc., and one way remains—more thorough refining of the raw material and an increase in the proportion of highly efficient products."

[Question] And more expensive ones?

[Answer] No, more efficient. For example, in the production of gasoline we try to use secondary petroleum refining processes. This reduces the expenditures substantially. The Moscow Petroleum Refinery, having made vigorous use of this and certain other industrial processes, obtained 5 million rubles of above-plan profit last year. On the whole for the sector, however, the product volume increased by 2 percent and we could increase the profit by 8 percent.

[Question] These industrial processes were not a secret even before....

[Answer] Probably. But there was no economic mechanism that would prompt the taking of that route. Everything was built on the principle: the more one did, the more one received, and it didn't matter how much was spent here. Human thinking is organized this way: is it in one's interest or not? There must be an efficient cost-accounting mechanism—namely, intraplant, affecting the interests of each worker—from director to operator. That "conventional" cost accounting, which has been in existence for several decades, cannot suit us. It should not matter to an operator whether some pump runs idle or not, or whether secondary products go for processing or are thrown out to be burned up.

It is possible that the cost-accounting formula should be more rigid: the product is thrown out, the pump is not turned off on time—give back some of the wages. We have created for ourselves, out of the leading economists and financiers of the sector, an organizing group, which has been entrusted with working out a living model of intraplant cost accounting. This is not a simple matter. It requires collective efforts and a calculation of the aggregate, including world experience. We hope to give an all-penetrative model of cost accounting that would not pass through the offices of a ministry or an enterprise, but would go down lower, to the shop, to the work place.

[Question] All the same, let me once again ask the question on this plane: why do the interests of the sector and the interests of the national economy not always coincide? If we speak of cost accounting and self-financing on the level of entire sectors, we are obliged to seek a path toward a harmonious concert of interests.

[Answer] Sometimes it is actually necessary to forego the interests of the sector. Frosts recently struck Siberia. They tell me: the sector's enterprises in Angarsk, Omsk and Achinsk must increase mazut production. This is at a time when we have taken a course toward deep raw material refining! I pass over in silence the fact that under the conditions of the operation of the Law on the State Enterprise it is complicated for me to handle such orders. This is an unprofitable business, the direct squandering of national wealth. Mazut as a source of obtaining energy constitutes a total of 15-20 percent worldwide, but for us—up to 40 percent. Last year having barely converted to self-financing, we placed ourselves on the brink of failure, since we had forced ourselves at a loss to produce an above-plan million tons of mazut. Do you remember what the frosts were like? Even in Moscow sometimes there was only enough mazut left for 8-10 hours operation for the boilers. It had nothing to do with cost accounting—hundreds of cities and settlements had to be heated.

Let us take a look, however, at the economics of this matter. Having sharply increased the mazut output, we have discontinued the secondary processes—for production of gasoline and diesel fuel, which affected the production of rubber and industrial carbon, and that means of tires and commercial rubber items as well. Let us think further. We supply mazut for 26 rubles a ton. Three tons are 78 rubles. In producing synthetic rubber from this amount of raw material we would obtain a ton of product worth up to 1000 rubles. This is not the entire loss. We must still pay fines for undersupply of tires and industrial rubber items according to the agreements. Not one arbitration board will accept our explanations concerning the Siberian frosts. The sanction mechanism operates like an adding machine and calculates our future payments for itself.

[Question] What is the way out?

[Answer] There must be all-round cost-accounting responsibility throughout the national economy, so that the losses that have occurred through no fault of ours are compensated for to the full extent of the damage. Unfortunately, this does not yet exist. Last year we paid fines of almost 200 million rubles, and they compensated us for damages in the amount of only one-fourth of this sum. The point is that we can impose sanctions only for the value of the raw material, and we ourselves have already paid for the cost of the finished product, which is three-five times more expensive. We have ministries—the Ministry of Railways, the Ministry of Power and Electrification—which generally bear the limited cost-accounting responsibility. Consequently, their errors are reflected in our results. Now the year has begun, we have failed to deliver 212,000 tons of bitumen—there is no shipment, even though the reservoirs are full. We can obtain several thousand rubles from the railroad workers, but we ourselves pay millions.

[Question] What happens if you do not take the extreme situations into account?

[Answer] Then there is one more example. This year 122,000 tires were ordered for the combines of the Don family. We built up the capacities at Chimkent, Voronezh and Belaya Tserkov. It now turns out: not 70,000 pieces, but only 16,000 will be issued from the combines. The plants will bear the damages, and there is no one to make responsible for it. I repeat, each ministry and department must have complete cost-accounting responsibility for the decisions made. What clause should pay us off for what irresponsibility or incompetence? Unfortunately, no effective economic mechanism has yet been worked out that guarantees full compensation for damage by the guilty party. This is a key problem of cost accounting. Until damage is covered from the public purse or the pocket of the one who has suffered, economic methods of management will remain catchwords, totally unsupported.

[Question] This means, in your opinion, that the self-financing mechanism has not had a chance to show itself at full strength?

[Answer] I have already said that the first year on self-financing turned out to be complicated. All the same, the new economic mechanism demonstrated its stability. Three-fourths of the enterprises fulfilled the profit plan and could even add an additional 100 million rubles to their funds. True, every fourth enterprise failed to cope with the assignments. The work on the "mazut" variant made itself known. Still the main conclusion is that the new mechanism is a good stimulant for enterprises to increase efficiency, but not in the least, if not in the greatest degree does it punish for any omissions in the cost-accounting work.

[Question] We all know the ministries' passion for forming centralized funds that are a little larger, often at the cost of enterprises that are working well. Last December, for IZVESTIYA's "Round Table," A. Samokhvalov,

director of the Moscow Petroleum Refinery, came forth and expressed, it seems to me, reasonable comments concerning your ministry, in connection with the distribution of profit among the budget, the ministry and the enterprise.

[Answer] The stereotype is well known: when you berate the ministry, you don't miscalculate. The new economic mechanism had to be written into the five-year plan, constructed in accordance with old canons. There are enough obscurities even today. Have you ever had to sit on a mountain and look down? There is no trail and you have to go down. You can also just sit still. We have been aiming at and have already achieved the goal of 70 percent of the above-plan profit remaining at the disposal of the enterprise. If A. Samokhvalov works this year the way he did last, he will obtain 3.5 million rubles of additional capital.

Leaf through the shorthand report of our last collegium. How the nature of the directors' speeches has changed. Somebody first went through the offices and tried to correct the plans. When it was understood, however, that this was a disadvantage, above all, to the entire collective itself, he began to seek other solutions: cut production expenditures and develop more efficient types of products. Quite a few difficulties were experienced with the market, for example, by the collective of the Sterlit Synthetic Rubber Plant. After studying the market demand they organized the output of liquid rubber for paint and varnish production based on production wastes, and not only eliminated losses, but also added on additional capital.

[Question] What will happen to the obviously unprofitable production facilities under the conditions of self-financing? Will they not have to be sold by auction?

[Answer] Last year we had 15 enterprises operating at a loss, and now only 11 of these are left. In 1989 we plan to rid ourselves completely of unprofitable enterprises. Bankruptcies, apparently, cannot be avoided. Last December in Sumgait we closed a butyl rubber production facility that had nothing but losses and a poor-quality product, and yielded us nothing. The director should now think about how to employ 300 workers and how to fill in the volumes lost. The Chimkentshina Association is doing poor work under the new conditions. After all, it was given major financial assistance. Measures have been outlined directed toward taking the association out of the ranks of the unprofitable in the second six months of 1988. The possibility is not ruled out that it will be necessary, making use of the Law on the Enterprise, to announce a competition to turn the state order over to other plants (along with part of the equipment and fittings).

[Question] Our readers think that we are selling too much raw material—oil and gas—instead of offering their processing products on the world market. Does our export not survive through the same raw material? The

cost-accounting income should be more actively supplemented by the currency receipts obtained through commodity export, is that not so?

[Answer] A broad program to increase the export potential is being worked out in the sector. A number of the production facilities of foreign firms are being drawn in for re-equipment—using loans for purchase abroad of equipment and clearing them off on a compensation basis. For example, for a long time a catalytic cracking by-product, including propylene, was used as fuel gas. It was supplied for 34 rubles a ton. Now negotiations are in progress with a Finnish firm on supplying it with concentrated propylene at a price several times higher.

This is the whole problem. In Mendeleyev's time, we had pools of sludge and petroleum slime—petroleum refining wastes that were harmful from the ecological standpoint. Today they have built up to 5 million tons. We have drawn Western firms into solving the problem. Two units are already operating in Yaroslavl. It is certain that in 4-5 years we will rid our cities of lakes of sludge and will make nature healthier. Moreover, we will obtain a fairly large profit in currency.

We are working on another idea—on creating a Soviet-American consortium. Its task will be to construct petrochemical complexes in Western Siberia. The capital investments are exclusively through the loans of foreign firms. From each ton of hydrocarbon raw material, costing 80 rubles, various petrochemical products will be produced here with a value of 400-500 rubles and higher.

A sectorial cost-accounting foreign trade association with a turnover of over a billion rubles is being formed here. Joint enterprises, with the participation of firms from Yugoslavia, the FRG and the United States, have been set up, and there are preliminary agreements on organizing six more. Our enterprises have been granted the right to supply for export the output produced above the assignments of the state order and obligations for deliveries.

[Question] Nikolay Vasilevich, what, in your eyes, is the main task of the sectorial staff, as applied to the conditions of self-financing? How is the transition to the new management structures being implemented?

[Answer] The task of the staff lies in saturating the sector with fresh ideas and carrying out a unified technical policy—well of course, and developing the initiative of the work collectives. You can load the plants with orders, but if there is no real interest, if you confine yourself only to administrative pressure, they will be fulfilled accordingly: "from these to those." We should cut the size of the ministry staff by 40 percent and create a network of state production associations. Their structure will mainly be built on the sectorial principle. In a number of cases a territorial variant is also possible, as, for example, in Azerbaijan, where our republic ministry has just been eliminated.

The main issue in all this work is not formal curtailment of the staff size, but creating the conditions for the enterprising and maximally independent work of the enterprises, shops and brigades. The pattern of the new thinking, already conceived under the conditions of self-financing, has been demonstrated by the collective of the Drogobych Petroleum Refinery. I cannot help but put in a good word for this collective. We were to develop the production of inhibitors to prevent pipe corrosion in the petroleum industry. The plan proposed by the scientists specified expenditures of 100 million rubles and the results in 10 years. The plant specialists, however, in conjunction with the Main Administration of the Petrochemical Industry of the Ukraine and the Lvov branch of the Masma Scientific Production Association, suggested a variant that would make it possible to develop the new production in one-and-a-half years with a total expenditure of 6 million rubles. It was nice to receive a letter of thanks from the Ministry of the Petroleum Industry which informed us that the "petrochemical" inhibitor was on a par with the best foreign models, and its use is reducing the amount of pipeline breaks by a factor of over 6.

This episode made us also take a new look at the efficiency of scientific developments. Starting this year we are converting sectorial science to cost accounting. The main line is this: only basic research will be financed in centralized fashion, and for the most part the institutes themselves will fill the portfolio of orders on the basis of agreements with the enterprises. I do not think that the directors will start to display immoderate lavishness in this case.

12151

Anomalous Properties of HF Discharge in Moist Air

18410262d Moscow *KHIMIYA VYSOKIKH ENERGIY* in Russian Vol 22, No 1, Jan-Feb 88 (manuscript received 2 Jun 86) pp 78-81

[Article by V.P. Grigoryev, Ye.T. Protasevich, and V.I. Tolmachev, Scientific Research Institute of Nuclear Physics, Tomsk Polytechnical Institute imeni S.M. Kirov]

[Abstract] An experimental study examined the peculiarities of an HF discharge in water vapor. It was found that the water molecules sharply changed the most important properties of the HF discharge plasma, which resulted in a compression of the plasma formation and decreased its initial volume by a factor of 20-25. With a lower water molecule concentration gradient, an orange plasmoid with a long afterglow appeared that mixed neither with the surrounding air nor with the HF discharge. It had sharp boundaries, a diameter of 5 cm, and a volume that was 1.5-2 percent that of the discharge in dry air. The plasmoid disappeared without a sound and changed its color from bright orange to bluish lilac. The basic mechanism of the decrease in the plasma temperature is assumed to be an exchange of energy between the plasma electrons and water molecules through oscillation-excited states at T_e is less than 1.5 eV. Figures 2, references 6: Russian.

6508

Stabilizing Effect of Aromatic Additives with Exciton Mechanism of Radical Formation

18410262a Moscow *KHIMIYA VYSOKIKH ENERGIY* in Russian Vol 22, No 1, Jan-Feb 88 (manuscript received 20 Mar 86) pp 31-34

[Article by Ye.I. Grigoryev, N.A. Slavinskaya, S.Ya. Pshezhetskiy, and L.I. Trakhtenberg, Scientific Research Institute of Physical Chemistry imeni L.Ya. Karpov]

[Abstract] The radiation yield of radicals following exposure to ionizing radiation is decreased if a small quantity of aromatic compounds is first added to the substance tested. Various mechanisms of this protective action have been suggested, such as charge transfer, capture of H atoms, and the energy of the electron excitation of molecules. The nature of stabilization must be determined in order to select additives to increase the radiation resistance of various substances and materials. This article studies the influence of the addition of benzene on the formation of methyl radicals in a matrix of xenon-containing methane upon bombardment of its surface at 77 K with metastable xenon atoms and upon γ irradiation. Methyl radicals are formed in this case as a result of the capture of xenon cryocrystal triplet excitons by methane molecules. The difference in the dimensions of the benzene and xenon molecules means that when benzene is dissolved in xenon, an area of deformation in the surrounding lattice occurs. The area may serve as a

small trap for excitons, which will be repeatedly trapped and liberated. The exciton capture rate constant of the benzene molecules at 40 K is $5 \cdot 10^{-7} \text{ cm}^3 \text{ s}^{-1}$. This is the mechanism of the stabilizing effect of benzene when alkanes are bombarded in the solid phase. Figures 3, references 11: 8 Russian, 3 Western.

6508

Effect of Fast Neutrons on Serine Proteases

18410247c Moscow *VESTNIK MOSKOVSKOGO UNIVERSITETA: SERIYA 2, KHIMIYA* in Russian Vol 28, No 6, Nov-Dec 87 (manuscript received 24 Sep 86) pp 601-603

[Article by M.A. Orolov, I.V. Golubtsov, and I.I. Nikolskaya, Department of Radiochemistry and Chemical Technology, MGU]

[Abstract] Inactivation of serine proteinases (in particular, α -chymotrypsin and subtilisin-72) upon exposure to γ - and B-radiation has been reported in a number of papers. The present paper studies the effect of a γ -neutron field on this inactivation process and compares the effect with results obtained by using γ -radiation, since neutron irradiation has a different mechanism of biologic action. ^{252}Cf (INK-5) with an activity of 1.63 GBq served as the neutron field source. The flux of fast neutrons (with an energy greater than 2.5 MeV) was determined with an ^{32}S activation detector. The principal input into the radiolytic process came from the proton output. A two-stage inactivation was observed. In the first stage, the activation of the proton output was quenched by the solvent and the principal input into the inactivation came from the OH radicals. In the second stage, the enzyme molecules were inactivated much faster under the effect of the γ -neutron field. This was evidently due to the fact that the proton output was included in the process. Doses exceeding the level of 10-15 Gy led to a faster drop in the catalytic activity. Calcium ions stabilized the enzyme solution during both inactivation phases. Thus, the inactivation of serine proteinases occurring under the effect of neutrons is due to the destruction of their conformation. Figures 2; references 8: 6 Russian, 2 Western.

7813

Mechanism of Tritium Mass Transfer in Neutron-Irradiated Lithium gamma-Aluminate

18410249 Moscow *ZHURNAL FIZICHESKOY KHIMII* in Russian Vol 62, No 1, Jan 88 (manuscript received 7 Apr 87) pp 210-211

[Article by A.N. Krutyakov, Ye.I. Saunin and V.V. Gromov, Institute of Physical Chemistry, USSR Academy of Sciences]

[Abstract] The mechanisms of tritium mass transfer in inorganic lithium-containing materials was investigated by studying irradiated $\gamma\text{-LiAlO}_2$ in the 500-1,200 K temperature interval. Analysis of experimental data

showed that the kinetics of tritium thermoextraction in the coordinates $\ln F = (\ln T)$ is rectilinear with a slope of $\frac{1}{2}$, which shows that it is the diffusion of tritium within the particle mass that limits the rate at which tritium is liberated in lithium aluminate. The mass transfer process consists of two stages: a low- and high-temperature phase with activation energies of 115 plus or minus 27.6 and 45.3 plus or minus 3.6 kJ/mol, respectively. This indicates at least two diffusion mechanisms: associative-dissociative and internodular. It was postulated that tritium formed as the result of a nuclear reaction is stabilized in an LiAlO_2 lattice as a "tritiated particle-defect" complex whose existence is thermodynamically probable up to some critical temperature as well as in the interstices. This mechanism could very probably have a general application. Figure 1; references 4: 2 Russian, 2 Western.

7813

**Scattering and Fluorescence Spectra Upon
Excitation of H_2O Vapor by Radiation at 248.5
nm from a KrF^* Laser**

18410262c Moscow *KHIMIYA VYSOKIKH ENERGIY*
in Russian Vol 22, No 1, Jan-Feb 88 (manuscript
received 9 Jun 86) pp 58-61

[Article by V.M. Mitchenkov, I.I. Ippolitov and V.M. Klimkin, Institute of Atmospheric Optics, Siberian Division, USSR Academy of Sciences]

[Abstract] A report is presented on investigation of the spectra of H_2O vapor in the 250-280 nm region, following excitation by radiation at 248.5 nm by a KrF^* laser. The results show that the photodissociation of H_2O in a field of powerful UV radiation leads to rapid formation of excited molecular oxygen. The H_2O vapor and a mixture of H_2O with other gases were excited by focused laser radiation in a quartz cuvette placed so that the laser radiation passed parallel to the entrance slot of a monochromator. The KrF^* electric discharge laser had an unstable resonator, yielding unfocused laser radiation with an energy density of about 2 MW/cm². The intensity at the center spot of $5 \cdot 10^{-4}$ cm² was about 5 GW/cm². It was found that dissociation of the H_2O molecules resulted in the formation of excited highly reactive decomposition products forming excited molecular oxygen in the course of rapid secondary photochemical reactions in about 1-10 ns. Figures 4, references 10: 1 Russian, 9 Western.

06508

Organic Paramagnetics: Present and Future

18410286 Moscow KHIMIYA: ORGANICHESKIYE
PARAMAGNETIKI: NASTOYASHCHEE I
BUDUSHCHEE in Russian No 3, Mar 88 pp 1-2, 25-27

[Table of contents, annotation, and excerpt from article by Anatoliy Leonidovich Buchachenko, corresponding member of the USSR Academy of Sciences and laboratory director, Institute of Chemical Physics, USSR Academy of Sciences, Izdatelstvo "Znaniye", 27,669 copies, 32 pages]

[Text] Annotation

Organic paramagnetics are a special type of substances among which nitroxyl radicals evoke the greatest interest. These compounds possess the unique capability for reacting chemically while preserving the radical's center of paramagnetism. Their numerous specialized applications and the prospects of their use in chemistry, molecular biology, and medicine are known.

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Organic Metals and Superconductors

This unusual, nontraditional combination of words (and concepts) was born quite recently—in the last decade. It stands for substances having a structure of organic, nonmetallic origin with electric properties that are typically metallic.

The architectural principle behind the structure of such substances is simple, and it conforms with the principle upon which the structure of all salts is based, beginning with the simplest—dietary or table salt, NaCl. When this salt forms, one electronic moves from the sodium atom to the chlorine atom, and the Na⁺ cation and the Cl⁻ anion come into being. The salt's crystal lattice consists of sodium and chlorine ions in an ordered arrangement. In this pair, the metal atom is an electron donor while the halogen atom is an electron acceptor. If we "substitute" the chlorine atom by an acceptor molecule—tetracyanoquinodimethane for example—then an electron is transferred from the metal to this molecule, and

an ion-radical salt forms. The anion in this salt is simultaneously a radical (it has one extra unpaired electron), and therefore such salts are organic paramagnetics.

Organic molecules can also act as donors: in this case they form paramagnetic cation-radicals. Donors in salts can also be substituted: iodine, phosphorus pentafluoride, or antimony or arsenic pentachloride may be substituted for the alkaline metals sodium or potassium. These chemicals act as acceptors that receive electrons, while neither the cations nor the anions of an ion-radical salt contain a metal.

Paramagnetic cations in ion-radical salts are usually large and flat. Among them, tetrathiofulvalene (TTF), tetrathiotetracene (TTT), tetraselenotetracene (TSeT), tetramethyltetraselenofulvalene (TMeTSeF), bis-ethylenedithiotetrathiofulvalene (BEDT-TTF) molecules have been found to be the most popular.

Yielding an electron and becoming cation-radicals, these large molecules pack themselves one above the other in the crystal lattice of ion-radical salts, in the form of almost infinitely long, practically linear one-dimensional chains of stacks. As a rule anions are almost spherical particles (PF₆⁻, I₃⁻, SF₆⁻, ClO₄⁻, SbF₆⁻, ReO₄⁻, etc.), and they form chains parallel to the main chains of paramagnetic cations. Thus, the entire crystal is organized as a set of alternating linear chains of cations and anions; these are called quasi-one-dimensional crystals.

This name reflects more than just the structural motif of their organization. It also emphasizes the "one-dimensional" nature of motion of electrons—the charge carriers in such crystals: Charges move only along the cation chains. For this reason the electrical conductivity of ion-radical salts is highly anisotropic: It is large along one of the axes of the crystal and negligible on others.

Far from all ion-radical salts are organic metals with conductivity approaching that of good metals. The path from ion-radical salts to organic metals was not simple; on this path from the initial salt, Na⁺(TCNQ)⁻, cations and ions had to trade places, metals had to be eliminated completely (even alkaline ones), and a quasi-one-dimensional organization of cations and ions had to be created in the crystal lattice. This complex path of exploration was traveled by Soviet scientists I.F. Shchegolev, E.F. Yagubskiy, M.L. Khidekel, R.P. Shibayeva, R.B. Lyubovskiy, L.I. Buravov, and their associates. There were many surprises on this path, among which one caused an especially large amount of trouble.

The problem is that the electrical conductivity of organic metals grows as temperature decreases (as with normal metals). There were hopes, and not unfounded at that, of transforming organic metals into superconductors—that is, into substances in which electrons are transferred without any kind of resistance, and consequently without any kind of losses of electric current and electric

power. In fact, when the temperature was reduced to $(-70)(-100)^{\circ}\text{C}$, the conductivity of organic metals increased (as would have been expected); but then it dropped sharply, and the organic metals transformed into dielectrics—that is, into insulators. The substance refused to conduct an electric current. The reason for this was predicted first theoretically and then established unambiguously—Payerlsovskaya [transliteration] instability of one-dimensional systems. The fact is that at certain critical temperatures the cation chains disintegrated into pairs in which distances were reduced, while distances between pairs increased, and this increase created tall barriers to electrons jumping along the chain and annihilated its electrical conductivity.

And so, on one hand the one-dimensionality of the chains was responsible for high conductivity or organic metals, while on the other hand it annihilated this conductivity, closing the path to organic superconductors. This paradox was successfully resolved, and organic superconductors were created by both Soviet and foreign scientists.

The temperature of transition to superconducting state for the first organic semiconductor, $(\text{TMeTSeF})_2^+\text{PF}_6^-$, was 0.9 K at a pressure of 1 GPa. It made its debut in 1980. Then appeared similar compounds in which PF_6^- ions were substituted by AsF_6^- , SbF_6^- , and ReO_4^- . It was found in 1981 that $(\text{TMeTSeF})_2^+\text{ClO}_4^-$ is an organic superconductor even at normal pressure with a superconductivity temperature of 1.2 K. Salts of BEDT-TTF with iodine appeared later on. They exhibited superconductivity at normal pressure, and their superconductivity temperature was raised successively depending on the iodine content to 1.5, 2.5, 3.3, and finally a record of 7 K. This record belonged to Soviet scientists from the Chernogolovka Department of the Institute of Chemical Physics of the USSR Academy of Sciences.

These successes were brilliant and inspiring, but in 1987 their glory faded in connection with a new brilliant event—discovery of superconductivity in inorganic ceramics. However, the paths of science are paths into the unexplored, they are difficult to predict, there are many surprises on these paths, and it would be unreasonable to abandon the search on the path of organic superconductivity, on a path which opened up new aspects of the chemical world. Even if organic superconductors will not be able to compete with superconducting ceramics, enticing prospects still remain in the creation and improvement of organic metals—a remarkable class of chemical compounds.

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Organic Chemistry Institute Director Speaks on Research Progress

18410233b Moscow KRASNAYA ZVEZDA in Russian
31 Jan 88 p 4

[Transcript of report by M. Voronkov, director of the Institute of Organic Chemistry, Siberian Department of the USSR Academy of Sciences, Irkutsk (by A. Batalin): "This Is Our Principle"]

[Text] Each direction of scientific research and each scientific development must simultaneously meet three criteria: fundamentality, originality and a practical conclusion.

All of the research that we do, as is customary at academic institutes, is fundamental. It is directed toward disclosing the secrets of nature: the fine structure and reaction capacity of chemical compounds and their conversions and toward discovering new reactions and new industrial processes.

The monographs and articles of our colleagues are translated and published in almost all the socialist countries, as well as in France, the FRG, Japan, England and the United States. For example, our monograph "The Reaction of Sulfur With Organic Compounds" was published in New York. "Do not pick up crumbs from another's pie," but obtain results that have no analogies in world science—that is our principle. In following it, the colleagues of the institute obtain about 100 authorship certificates for inventions and several foreign patents.

The institute's scientists have developed an all-purpose aqueous polymer solution to quench-harden metals. The new quenching medium surpasses earlier known analogous media in many parameters: the quality of the metal, the productivity of the operation, the wide range of work temperatures and the possibility of hardening items of the most varied sizes and configurations from various grades of steel. There is no problem of utilizing the spent liquid—it is ecologically harmless.

Specialists confirm that, of the many local-action hemostats known, ferracryl has a special place. It successfully combines hemostatic action with an anesthetizing effect. Surgeons treat the organ being operated on with ferracryl, and the operation continues, as the doctors put it, "dry." Ferracryl is more effective in both the normal state of the blood coagulation system and in cases of its pathological disorders. A considerable reduction in loss of blood and time of operations, a saving of donor blood and dressings and facilitation of the surgeons' work—that is what ferracryl represents.

In addition to the wide-scale use in all spheres of surgical practice, the preparation can be used in treating production, athletic and everyday wounds and burns.

For over 100 years the opinion that silicon compounds are biologically inert and useless has reigned. It was called the "king of the inorganic world" and it was impossible to discern the perspectives for its effect on living organisms.

Scientists of the Institute of Organic Chemistry discovered the high toxicity and biological activity of a new class of silicone compounds—1-arylsilatranes. The scientists' discovery served as the start of a wide search for biologically active silicon compounds and a multiplanar study of silatranes. Thus, a new scientific direction was born—biosilicoorganic chemistry.

Silicone biostimulators developed at the institute, mival, for example, are widely used on cotton plantations. Seeds treated with mival acquire a resistance to the caprices of nature, give good shoots and grow fast. The cotton-harvesting begins earlier and its quality and yield rises. The economic effect in cotton-raising in Uzbekistan alone is valued at over 100 million rubles.

Other developments at the institute are biologically active substances used in poultry breeding and fur farming, viniculture, the food industry and in the production of agricultural fertilizers.

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